

Aus dem Pathologischen Institut des Kantonsspitals St. Gallen.
(Chefarzt: Prof. Dr. E. Uehlinger).

**A Comparative Study of the Course of Miliary Tuberculosis
in the Elderly versus Miliary Tuberculosis in Childhood**

Inaugural-Dissertation

zur

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This comparative study comprises a review and analysis of the clinical and pathological records of 12 cases of miliary tuberculosis occurring in elderly persons (beyond 70 years of age) compared with a like research into the records of 12 cases of miliary tuberculosis of children from one to fourteen years of age.

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I. Clinical Survey.

In this clinical survey the two groups were studied and analyzed to see how they compared in the course of the disease in such major factors as duration of the illness, the fever, the blood sedimentation rate, the blood picture, the Röntgen pictures where made, the pulse and the history of the patient as given by himself. Sometimes in the elderly cases, Röntgen pictures were not made because the patients entered the hospital in such a late stage of exhaustion and illness, that they were not in a condition to have such pictures made. In addition some cases were not diagnosed as tuberculosis, and pictures were not made. Likewise in the childhood cases, some patients, upon hospital entry, were in such an advanced stage of illness, that the taking of Röntgen pictures was totally impracticable.

(a) Fever.

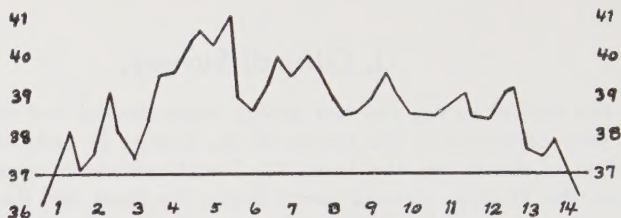
In comparing the course of the fever for the last days of the illness in 12 cases of childhood miliary tuberculosis with the same number of cases of miliary tuberculosis in the elderly it is noted that the fever in children runs, in general, considerably higher and more intense than the fever in older patients. In children the fever might be described as irregular and fluctuating. In them temperature varied from a low of 35.4 to a high of 41° centigrade. Often the temperature was low in the mornings and high at night although this was not always true. A day's range of temperature fluctuated as much as 2.5° C. in one day. At exitus their temperatures almost always were high, being (omitting exceptions) from 39.3 to 40.8° C.

A set of curves taken from the most typical 5 cases of each series shows the comparison graphically, for the last days of the disease. Figure 1 shows the fever curves of 5 children who had miliary tuberculosis; in this series it is seen that childhood cases No. 2 and 11 reached temperatures of 41° C. or thereabouts; that occasionally sub-febrile temperatures were seen; that the fever fluctuated considerably and that in general temperatures up to 40° C. were common.

In the older patients the fever, in the last days, was low most of the time, often subfebrile and barring exceptions, usually remained low or subfebrile right up to exitus. In the case of these elderly people, the fact that there often was no fever, was one of the reasons why the diagnosis of tuberculosis was sometimes missed. In their group, the temperature varied from a low of 35.2 to a high of 39.4° C. Sometimes in them the temperature was low in the mornings and higher at night although as a rule the daily fluctuation was not as marked in them as in the young patients. Even so, a day's range of temperature in them also varied as much as 2.5° C. in one day.

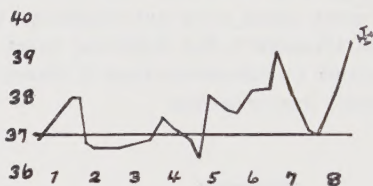
Case
No.

2 Temp.



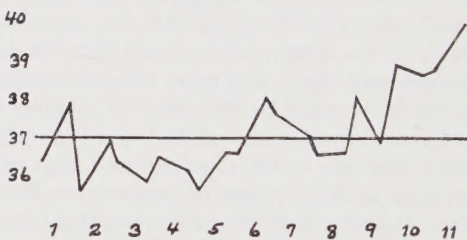
Last 14 days.

6 Temp.



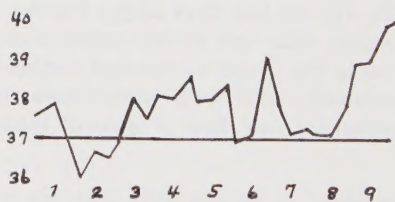
Last 8 days.

8 Temp.



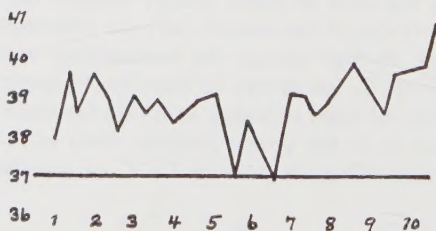
Last 11 days.

9 Temp.



Last 9 days.

11 Temp.



Last 10 days.

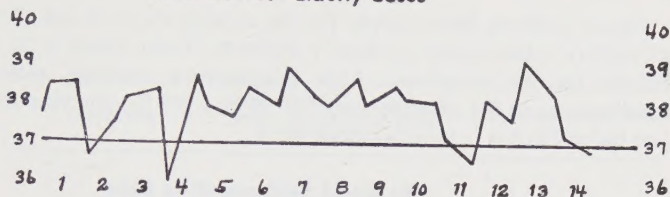
Fever
Curves
Childhood
Cases.

Fig. 1.

Case
No.

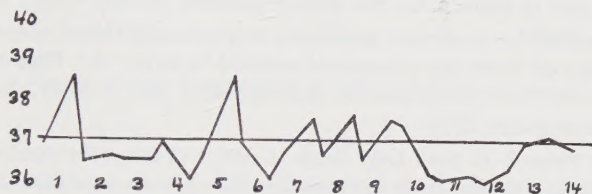
Fever Curves - Elderly Cases

3 Temp.



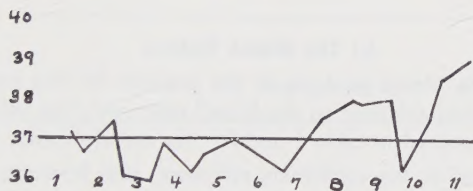
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4 Temp.



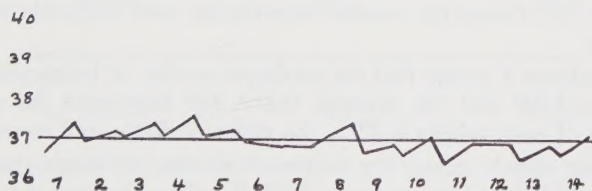
Last 14 days.

9 Temp.



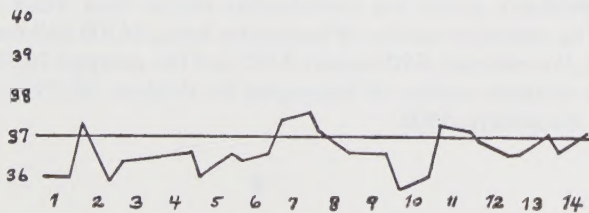
Last 11 days.

10 Temp.



Last 14 days.

11 Temp.



Last 14 days.

Fig. 2

Figure 2 shows fever curves for the closing days of the illness in 5 cases of miliary tuberculosis in elderly patients. From these it is observed that except for an occasional high temperature reading, most temperature readings are in the neighborhood of 36 and 37° C., and that the temperature just before exitus is usually about 37° C.

(b) Blood Sedimentation Rate.

The blood sedimentation rate in all patients except one, are tabulated. These figures are shown in table I for the childhood cases of miliary tuberculosis and in table II for the elderly patients having miliary tuberculosis.

The values for maximum, minimum, and average blood sedimentation rates are taken off from the above and entered in table "A". Thus it will be noted that for children, the maximum sedimentation rate is 48/81, the minimum 4/9 and the average 25/50.

From these it is seen that there is not a great difference in the general blood sedimentation rates between the two groups, and that in fact the average rates are surprisingly close together, — being 31/54 for the elderly versus 25/50 for the children, — and that they both are considerably greater than normal.

(c) The Blood Picture.

The results of the blood analysis of the patients for the last days of the disease are tabulated similarly to the blood sedimentation rate. For children the analyses are entered in table I and for the elderly cases, in table II.

From tables I and II, the maximum, minimum, and average values of the number of leucocytes, and combined neutrophils are taken off and entered in table "A". The percentages of stab-formed and segment-formed nuclei are listed individually in tables I and II; they are shown as combined values in table "A". Except for unusual occurrences, only moderate shift to the left is noted.

For children it is seen that the maximum number of leucocytes is 14,100, the minimum 5,900 and the average 10,519. For them also the maximum percentage of neutrophils is 92 %, the minimum 54 %, and average 73.5 %.

For the elderly cases, the maximum number of leucocytes is 9,150, the minimum 3,100 and the average 5,622. For them likewise the maximum percentage of neutrophils is 97 %, minimum 69 % and the average 78.5 %.

In comparison it is noted that the figures for the number of leucocytes in the children's group are considerably higher than those in the elderly group. The maximum number of leucocytes being 14,100 (children) versus 9,150 (elderly), the minimum 5,900 versus 3,100 and the average 10,519 versus 5,622. Thus the average number of leucocytes for children, 10,519 is almost double that for the elderly, 5,900.

	Leucocytes	Neutrophiles (combined stab- and segment formed Nuclei).	Blood Sedimentation Rate.
Children			
Maximum	14,100	92%	48/81
Minimum	5,900	54%	4/9
Average	10,519	73.5%	25/50
Elderly Patients.			
Maximum	9,150	97%	68/90
Minimum	3,100	69%	9/21
Average	5,622	78.5%	31/54

Table "A"

The comparison of the percentage figures for neutrophiles in the 2 groups is not so striking as is the comparison of the leucocyte figures. But even so, it is seen that the elderly group has higher values than the young group. The maximum percentages of neutrophiles being 97 % (elders) versus 92 % (children); the minimum 69 % versus 54 % and the average 78.5 % versus 73.5 %. In general the elderly group had an average of 5 % more neutrophiles than the childhood group. Children normally have a relative physiological lymphocytosis, and therefore a smaller percentage of neutrophiles than grown persons. The 5 % difference in neutrophile percentages (in our 2 military tuberculous groups) is approximately the same as the difference between the normal neutrophile percentages in healthy children and healthy grown persons. Therefore it is seen that the relative increase in percentage of neutrophiles in our 2 sick groups is approximately the same.

In both groups there is some shift to the left of the neutrophiles as seen in tables I and II. In the children's group one finds a clear cut neutrophilia with a moderate leucocytosis, while in the elderly group a moderate neutrophilia with a normal leucocyte count.

(d) Duration of the Disease.

In the young patients comprising this study, once military tuberculosis had taken root in a child, the course was comparatively rapid. The duration of the disease from first indications to exitus for these young persons varied from 2 weeks to 6 weeks. The one exception, case no. 5 lasting approximately 3½ months, had received 16 grams of streptomycin intramuscular and intra-lumbar in the 10th to the 40th days of the sickness. One other patient, case no. 4 received 1.59 grams of streptomycin but the effect of this amount is considered to have been negligible. Neither PAS nor streptomycin was administered to any of the other children. The average duration of the disease in the 11 children other than case no. 5 was 24.3 days.

In the group of older patients of this study, the duration of the military tuberculosis ranged from 2 weeks to 6 months. In 2 cases the duration of the disease was indeterminable. In general in these elderly persons the duration of the disease was longer than 1 month, as there were only 2 patients with a duration of less than 1 month, whereas there were 7 patients with a duration greater than 1 month, 6 with a duration greater than 6 weeks, 4 with a duration of 8 weeks or more, and 3 with a duration of 3 months or more.

In the 2 cases of old persons with military tuberculosis in whom the disease ran a course in 2 weeks and 15 days respectively, both are suspected of having had old general tuberculosis, in one case of about 16 months, and in the other of 5 to 6 years. Neither PAS nor streptomycin was administered to any elderly patient.

Nr.	Name	Age	Sex	Fever		Respiration	Cyanosis	Main Symptom	Thorax	Röntgen Finding	Blood	Picture		Blood	Sedim. Rate		Clinical	Diagnosis	Duration	of Illness	Infection's Source		Remarks		
				Duration	Type					Leucocytes	Neutrophiles.														
		Stabnuclei	Segmentnuclei								Eosinophile	Basophile	Monocytes	Lymphocytes	Plasma Cells										
																in percent.									
1.	Gm, H.	1	♀	?	Once 38.2° then in last 2 days 39—40°, C.			Meningitis. Paresis.		Röntgenoscopy negative.	11,300	34%	42%	0	0	3%	20%	1%	4/9	Primary tuberculosis (of lung?) with tuberculous meningitis.	15 days	Aunt (double sided cavernous lung Tuberculosis)			
2.	Hu, C.	3	♀	4 weeks	1 week subfebrile then irregular up to 41°. C.	At end Cheynes Stokes		Meningitis. Paresis.		No Röntgen Picture; no Röntgenoscopy.	8,000	12.	62.	0	0	9	16.	1	10/31	Poliomyelitis acuta anterior meningitic bulbar form. At the end encephalitis.	6 weeks	Milk?			
3.	Po, J.	3	♂	2 weeks	1 week subfebrile, otherwise irregular to 38.3° C.	Quiet	None	Meningitis.		No Röntgen Picture; no Röntgenoscopy.	10,000	3.5	59.	0	1.5	12.5	23.	0.5	15/35	Tuberculous meningitis.	3 weeks				
4.	Al, W.	3	♂	3 weeks	Irregular to 39°. C.; terminal to 41°. C.	At end Cheynes Stokes	Yes	Meningitis.		No Röntgen Picture; no Röntgenoscopy.	13,800	15.	61.	0	0	6.	18.	0		Tuberculous meningitis.	3 weeks	Fistulous bone tuberculosis in same house.	Received 1.59 grams streptomycin.		
5.	Fr, A.	3	♀	2½ months	Approx. 3 weeks subfebrile; app. 7 weeks irregular to 39.6° C.			Meningitis; hemiparesis		Röntgenoscopy negative.	8,700 7,700	8.	71.	0	0	5.	15.	1	38/65 40/64 8/21 11/25	Tuberculous meningitis (after streptomycin treatment). Enderteritic encephalomalacia sinistra.	3½ months	Milk?	Received 16 grams streptomycin i. m. and i. l.		
6.	An, H.	3½	♀	4½ weeks	4 weeks contin. 37.7 to 38.1°; remain. irreg. to 39.4° C.			Meningitis.		Röntgen picture: Tbc. of left hili glands.	7,400 5,500 9,200 7,000	10.5 9.	53.5 35.	0 1.	0 0	10.5 7.	25.5 48.	0 1	45/90	Tuberculous meningitis.	5 weeks (for tbc. mening.)	Nurse in hospital	Primary infection about 8½ months before exitus. App. 5 months later child had measles.		
7.	Gu, I.	4	♀	1½ weeks	Irregular between 37.7° and 39.6° C.		Yes	Meningitis.		No Röntgen Picture; no Röntgenoscopy.	12,000	18.	74.	0	0	2.5	3.5	0		Tuberculous meningitis.	3 weeks				
8.	St, S.	4	♀	4 weeks	Irregular to 39°. C.			Meningitis.		Röntgen picture: fresh primary complex left lung upper lobe.	14,100	15.	69.	0	0	6.	10.	0	48/81	Tuberculous meningitis; fresh prim. comp. in left upper lobe and dir. haem. propagation; for miliary tbc. no clinical basis.	6 weeks	Grandmother († on seemly certain tbc. pulmonalis).			
9.	Fi, A.	6½	♀	3 weeks	Irrgular to 39.6° C.			Meningitis.		Röntgen picture: rest after pleuritis left	5,900	22.	54.	3.	0	0	21.	0	26	Tuberculous meningitis after pleuritis exsudativa.	app. 3 weeks (for tbc. mening.)	Pleuritis exsudativa 5 months before exitus.			
10.	Sa, B.	7	♂	12 days	4 days subfebrile; others: irregular to 38.4° C.	Irregular.		Meningitis.		Somewhat enlarged hili and single points suspect for spreading	12,500	12.	56.	0	0	2.	30.	0	35/60	Acute meningo-encephalitis; pyogenic rhinitis with questionable sinusitis maxil. left; basal focal pneumonia.	2 weeks				
11.	Bu, A	7	♀	4 weeks	In hosp. last 10 days cont. febrile; before hospital entrance irregular, moderate to 38 for app. 17 days	sharpened breathing.		Meningitis.		Def. hili gl. and paratr. gl. enlarg. r. prim. foc. in r. lung upper l. w. flecky striped outlines	13,500	5.	65.	1.	0	1.	28.	0	12/38	Tuberculous meningitis; primary tuberculosis of r. upper lung in retrogression; paratr. gl. r.	app. 3 weeks (for tbc. mening.)	Father (open lung tuberculosis).	Primary tuberculosis discovered 2 months before exitus.		
12.	An, P.	14	♂	app. 3 weeks	Irregular to 38.2° C.			Meningitis.		Both hili wide and flecky; miliary spots in both lung flds.	8,400 10,900	14. 31.	60. 52.5	1. 0	0.5 0	9. 7.5	14. 7.	0.5 0	28/58	Tuberculous meningitis; miliary tuberculosis.	2 weeks	10½ months before exitus became ill with lung tbc.			

Table I Clinical Survey Childhood Cases.

Nr.	Name	Age	Sex	Fever		Respiration	Cyanosis	Thorax Röntgen Finding	Blood Picture							Blood Sedim. Rate	Weight Change	Clinical Diagnosis	Duration of Illness	Remarks	
				Duration	Type				Leucocytes	Neutrophiles		Eosinophile	Basophile	Monocytes	Lymphocytes	Plasma Cells			(Miliary Tbc)		
		Stab nuclei	Segment nuclei																		
in percent																					
1.	Fr, A.	72	♂	4 days (hospital)	Subfebrile			Emphysema, otherwise nothing special	5,200	18.	52.	0	0	2	28.	0	68/90	— 10 kg in last month	Tuberculosis of both kidneys with tbc. of desc. urin paths (bladder, prostate, semin. vesicles); uremia with uremic gastroenterocolitis; Lung emphysema; Inguinal hernia dextra.	6 weeks	Troublesome miction for more than 4 years.
2.	Bu, T.	73	♀	4 days (hospital)	1 day subfebrile; other between 37.8 and 38.7	Frequent, superficial	Outspoken peripheral Cyanosis	Broad, fine flecky, partly confluing shadows on both sides, esp. right	3,500	2.	95.	1	0	0	3.	0	23/50		Tuberculosis of the lungs, preponderately right.	3 months	Probably a primary infection.
3.	Pr, L.	75	♀	15 days (hospital)	Fluctuating to 39.2 C.	Dyspnoea		Fine to coarse flecky shadows in r. low. fld.	10,000 8,300	4. 10.	56. 69.	1 0	0 0	4 2	35. 19.	0 0	76/105 60/95 48/75 74/104 60/103 35/70	— 8.5 kg	Bronchitis tbc. r. w. atelectasis of r. low. lobe with sec. decay. Thick dis. seed. i. r. mid. and l. low and mid. fld., prob. in up. flds. Myodegen. and insuff. cordis; general arteriosclerosis: ri. convex kypho-skoliosis, St. aff. apoplexy li.	3 months	Had lung tuberculosis for more than 10 years.
4.	Me, A.	76	♀	18 days (hospital)	Subfebrile with spurts to 38.6 C.	Light dyspnoea; at end Cheynes-Stokes	Cyanosis of lips	Miliary fine flecky shadows on both sides	5,800	50.	36.	0	1	3	10.	0	9/21	Constant	Miliary tuberculosis; tuberculous meningitis; thrombo-phlebitis of lower left leg.	1 month	
5.	Sch, A.	77	♂	6 days (hospital)	Subfebrile 1 day otherwise irregular to 39. C.			Congested hili with mod. transsudate in r. Sins.	5,300	33.	52.	0	0	1	14.	0	13/26	— 4.3 kg in last week	Marasmus senilis; dementia senilis. General arterio-sclerosis; terminal hypostatic pneumonia.	Unknown	
6.	Ka, L.	77	♀	1 day (hospital)	37.4	Rattling, pt. bronchial breathing on both sides numerous rales ri.	Cyanosis of lips and mucous membr's.											— 2.5 kg	Decompensated hypertonia; coronary sclerosis; thrombosis l. lower leg; lung embolism? Hypostatic broncho-pneumonia; bronchiectasis; general arteriosclerosis.	2 weeks	
7.	Zu, K.	78	♀	15 days	Subfebrile and changing to 38.2 C.	Dyspnoea		Flecky infiltrate in right lower field	6,000	5.	74.	1	0	4	16.	0	41/74	— 8.5 kg in last 10 months	Tuberculosis of right lung? Bronchopneum. Marasmus senilis; myodegen. cordis. Osteoporosis; colicystitis.	15 days	Had gen. tuberculosis for at least 16 months.
8.	Al, M.	78	♀	4 days (hospital)	Fluctuating between 37.8 and 39.4 C.	Severely dyspnoic	Marked	In ri. mid. & low. fld. multi-pneum. foci; in left lower fld. single pneum. herd.	5,600	28.	48.	0	0	4	20.	0	10/33	— 2.5 kg in last 8 months	Myodegeneratio cordis arteriosclerotica; hypertonia; stasis; Chron. unspec. Pneumonia of ri. lower lobe Emphysema-bronchitis.	10 weeks	
9.	Ba, M.	79	♀	10 days (hospital)	Subfebrile and changing to 39.0 C.	dyspnoic	Marked	Emphysema; effusion left basal. Cor bovinum									20/43	— 5.1 kg in last 11 days	Myodegeneratio cordis; nephrosclerosis; dementia senilis.	6 months	Had heart trouble for many years.
10.	Ke, M.	79	♀	34 days	12 days subfebrile otherwise fluctuating to 39. C.			A fine miliary "Seeding" in both lungs	4,000	14.	55.	0	0	9	22.	0	35/59		Miliary tuberculosis, elders' spreading in both lungs? Gen. arteriosclerosis; senile dementia; Myodeg. cordis decompensata.	8 weeks	
11.	Sch, K.	79	♀	14 days (hospital)	Subfebrile	Dyspnoea nights	Moderate	Negative	4,300 12,000 9,400	26. 28. 22.	26. 52. 64.	3 1 1	0 0 0	10 7 7	35. 12. 6.	0 0 0	50/68	— 11 kg in last 3½ months	Myodeg. cord. Mitral insuff. Coronar sclerosis? Lung infarct (emerging f. heart or leg vein thrombos.) with infarct pneumonia. Thrombosis of veins of legs. Decubitus sacral and on the heels.	4½ months	Patient felt weak for the last 1½ years.
12.	To, G.	85	♂	6 days (hospital)	2 days subfebrile, other with spurts to 38.6 C.				3,100	64.	16.	0	2	1	17.	0	15/35	— 4 kg in last week	Encephalomalacia; inflammation of glandula sub-mandib. (ductogen); Stomatitis. Double pneumonia. Hydrocele sinistra.	Unknown	

Table II Clinical Survey Elderly Cases.

The average duration of the disease in old persons was a little over 10 weeks.

The individual duration of the disease in the 2 groups is given in table I for children and table II for elderly persons. In general it is seen that the duration of the disease in the elderly persons was almost 3 times as long as in the childhood group.

(e) Clinical Diagnosis.

It is especially noteworthy that in children, miliary tuberculosis attacked the meninges in every case, and as a result, most cases of tuberculous meningitis were correctly so diagnosed clinically. The participation of the meninges in the disease process generally so aggravated the illness of the child, and so affected the symptoms that it was brought to the hospital for treatment because of suspicion of meningitis or tuberculous meningitis. Thus it is noted that a clinical diagnosis of tuberculous meningitis was correctly established in 10 out of the 12 cases. The attacking of the meninges by the tubercle bacilli also no doubt caused the disease in the children to run such a comparatively faster course to exitus, than was true in the older patients.

The 2 children's cases that were not so diagnosed were diagnosed as 1. Poliomyelitis acuta anterior, meningitis bulbar form, at the end encephalitis; and 2. acute meningo-encephalitis, pyogenic rhinitis with questionable sinusitis maxillaris sinistra, basal focal pneumonia. In both these cases there had been strong clinical suspicions of tuberculous meningitis; but the spinal liquor tests and cultures in both cases indicated no tubercle or other bacilli in it, or other evidence of tuberculosis. The thorax Röntgen picture for case no. 10 gave no evidence sufficient to warrant a diagnosis of tuberculosis.

It is noteworthy that tuberculous meningitis did not occur in any old person in this study, whereas the meninges were involved in every case in the children comprising this work. In the case of the children this most probably made the course much more intense and rapid, and more easily recognizable clinically. The clinical diagnoses for the elderly patients are listed in table II.

In the elderly group, 3 cases were diagnosed as one or another form of tuberculosis, 3 as miliary tuberculosis, while 6 were not given any listing of any form of tuberculosis in the clinical diagnosis.

(f) Urine Diazo Reaction.

In all of the urine Diazo reactions that were carried out, the reaction was negative in every instance. This test was performed on childhood cases no. 2, 7 and 12; and in elderly cases no. 9 and 10.

II. Anatomical Analysis.

(a) Miliary Tuberculosis.

The most striking difference that comes to light in comparing the miliary spreading of the two groups, is that in the childhood group, the tubercle bacilli spread to the meninges in all cases, whereas in the elderly group in no case was there a tuberculous spread to the meninges.

Further study of the hematogenous spread in children, showed the presence of miliary tubercles in the following organs in the following numbers of patients: leptomeninx 12, spleen 12, lungs 11, liver 11, kidneys 7, brain surface 2, ependym 1 and tonsils 1.

Summarizing the children's cases it is seen that the miliary tubercles spread by hematogenous paths, occurred in the following organs in the following order of frequency (highest frequency first): leptomeninx, spleen, lungs, liver, kidneys, brain edge, ependym and tonsils. (Table III).

On the other hand the analysis of the hematogenous spread in the elderly patients, showed the presence of miliary tubercles in the following organs in the following numbers of persons: lungs 12, spleen 12, liver 12, kidneys 9, pericard 2, lymphnodes 1, larynx 1, and serous membranes 1.

Thus in the older group, miliary tubercles spread, by hematogenous routes, into the following organs in the following order of frequency (highest frequency first): lungs and spleen and liver, kidneys, pericard, lymphnodes, larynx, and serous membranes. (Table IV).

(b) Other Tuberculosis Findings.

In the childhood cases the location of the tuberculous primary complex could be reasonably accurately estimated in 11 out of 12 cases; the location was in the lungs in 9 cases, and enteral in 2 cases, while in one case it was not determined, due most likely to the fact that this was a routine autopsy, at which apparently the primary complex was overlooked, since it (autopsy) was not carried out with special reference to this study.

The 9 cases where the primary tuberculous complex was found to be in the lungs with tubercular involvement of the corresponding tracheobronchial lymph nodes are: cases no. 1, 3, 4, 6, 8, 9, 10, 11 and 12. Of the foregoing, cases no. 3, 6, 8, 9 and 10 show the left lung was the seat of the tuberculous primary focus while cases no. 1, 4, 11 and 12 reveal that the right lung was the lung so involved. (Table III).

The 2 children's cases, where the primary tuberculous complex was considered to be enteral with tuberculous involvement of the corresponding mesenteric lymphnodes, are cases no. 2 and 5. These two "enteral" cases are considered to probably be the result of infection from milk. Child case no. 7 is the one, where the primary complex was overlooked at autopsy.

Post primary tuberculosis in child patients could be ascertained in only three cases; these are represented by cases no. 3, 9 and 12. In no. 3 is revealed an ulcerous tonsillar tuberculosis, which is considered not to constitute a second primary complex since the regional lymphnode swelling is lacking. The cheesy foci in the tonsils are very small, so it is not certain whether they arose through "Abseuchung" from primary foci or through haematogenic spreadings such that they would be regarded as miliary tubercles. Child case no. 9 is an instance of total pleura adhesion on the left side; this is considered a contact pleuritis issuing from the subpleural primary (lower lobe) lung herd situated on the same side. Case no. 12 shows conglomerate tubercles in the right hemisphere, liver and spleen of varying size, which had arisen by previous haematogenic spreading; this is an example of spread by protracted spreading.

No children's cases of lung tuberculosis developed and there was no bronchial perforation of cheesy tracheo-bronchial lymphnodes.

In the elderly patients, the location of the primary complex, in general, could not be determined with as much certainty as was true in the young patients. In the elderly patients, all cases, had all probably had their primary complex (primary infection) many years before. And since most of them subsequently had post primary changes that spread into various parts of the body, it is scarcely possible at routine autopsy, to determine what was the primary complex.

However it is estimated, that the location of the primary complex in the elderly was in the lungs with corresponding tracheobronchial lymphnodes in 3 cases; these are cases no. 2, 5 and 11. The tracheobronchial lymphnodes were involved in 6 other cases, namely cases no. 4, 6, 7, 8, 9 and 12, although the site of the primary focus in the lungs could not be definitely fixed. In 4 of the foregoing 6 cases, however, it is possible that the primary focus was in the lungs since the tracheobronchial lymphnodes show old cheesy tuberculosis or hyaline-nodular tuberculosis; these 4 cases are no. 7, 8, 9 and 12.

In 2 other elderly cases, no. 1 and 10, the primary complex was not definitely ascertainable. Elderly case no. 2 has many of the characteristics of a recent primary infection whose primary complex consists of a primary focus in the lung, with co-involvement of the corresponding tracheobronchial lymphnodes. (Table IV). (Elderly case no. 2 is treated more at length under part III Special Cases).

Post primary tuberculosis in the elderly is classified in 2 groups, namely pulmonal tuberculosis (haematogenous and phthisic forms) and extra pulmonal haematogenic tuberculosis.

In 8 elderly cases, no post primary lung changes could be found whereas in the 4 cases represented by no. 2, 3, 5 and 10 phthisic changes in the lungs are positively shown. Of these 4 instances, two are examples of ulcerous

"Abseuchungs" tuberculosis (case no. 2 being ulcerous intestinal tuberculosis and case no. 5 ulcerous tuberculous laryngitis and ileitis).

In six examples of extra pulmonal haematogenous tuberculosis the following findings are seen: cases no. 1 and 7 are instances of cavernous or propagated urogenital tuberculosis; in addition in case 7 the cutis and skeleton are also involved. Case no. 10 and 11 are examples of cheesy adrenal gland tuberculosis, while case no. 12 represents a case of cheesy nodular tuberculosis of the prostate. The total pericard adhesion of case no. 8 is also probably to be considered as haematogenic in origin.

(c) Number of Previous Spreadings.

Table IV shows the number of previous spreadings in the elderly cases. It is seen that in 9 of the 12 cases, the number of previous spreadings is estimated. Case no. 7 is considered to have had from 1 to 2 such spreadings; case no. 1 at least one (possibly more) previous spreadings; cases no. 4, 5, 6, 8, 10, 11 and 12 one spreading each; cases no. 2 and 9 no previous spreadings while for case no. 3, no accurate estimate is deemed practicable.

In the children's cases, in only a few instances was there a spreading episode between the primary complex and the last haematogenic spread which led to exitus. These are cases 3, 9 and 12. In only one case can it be definitely affirmed that there was a previous haematogenous spreading; this is case no. 12 with an old conglomerate tubercle in the right hemisphere and old tuberculous foci in the liver and spleen. In all the other childhood cases the miliary tuberculosis follows rapidly on the primary complex.

(d) Spreading Source.

In the study of the autopsy reports, a survey was made to determine, if possible, what were the most likely sources of spreading of the tubercle bacilli. In the children, the spreading source is determined to be the fresh primary complex, since in no case, (with one exception, case no. 12) was a post primary tuberculous focus found that could have been the spreading source. In all other cases one finds a cheesy primary complex, with miliary tuberculosis evolving soon after the setting in of the infection (primary complex).

Thus in the childhood tuberculous cases, analysis indicated that the following were the distributing sources: right lung and regional lymphnodes 4, left lung and corresponding lymphnodes 5, mesenterial lymphnodes 2, and unknown 1. (Table III). These were distributed as follows: right lung and regional lymphnodes cases no. 1, 4, 11 and 12; left lung and corresponding lymphnodes cases no. 3, 6, 8, 9 and 10; mesenterial lymphnodes no. 2 and 5; unknown case no. 7.

Nr.	S.N.	Name	Age	Sex	Primary Complex.				Post Primary Tuberculosis	Spleen	Miliary Tuberculosis							Spreading Source	Remarks
					Primary Herd		Lymphnodes		(other than miliary tuberculosis)	Actual Weight Normal Weight	Lungs	Spleen	Liver	Kidneys	Leptomeninx	Lymphnodes	Other		
					Lungs	Intestine	Tracheobronchial	Mesenterial											
1.	207/45	Gm, H.	1	♀	Cheesy tbc. primary herd in tip of right lung upper lobe.		Cheesy tbc. of right trach-bron. lymphnodes			$\frac{50}{(37)}$	++++	+++	++	+++	+++			Primary Complex	
2.	389/41	Hu, C.	3	♀		Fresh abdom. pri- mary compl. (ulc. Peyer' plaques)		Cheesy Mesen- terial lymphn.		$\frac{25}{(35)}$	+	+++	+		+++		Brain edge +	Primary Complex	
3.	497/42	Po, J.	3	♂	Fresh cheesy tbc. primary herd in left lung lower lobe.		Caseation of corresp. trach-bron. lymphnodes		Ulcerous tonsillar tuberculosis.	$\frac{60}{(43)}$	+	++	+++		+++			Primary Complex	
4.	442/48	Al, W.	3	♂	7/8 inch subpleur. cheesy pneum, pri. herd in right upper lobe.		Cheesy nodous tuber. of corresp. lymphnodes.			$\frac{40}{(43)}$	++	+++	++	++	+++	++		Primary Complex	
5.	575/48	Fr. A.	3	♀		Enteral		Cheesy Mesen- terial lymphn.		$\frac{40}{(35)}$	++	+	++		+++			Primary Complex	Endarteritic encephalomalacia. (tuberculous endarteritis); streptomycin treatment.
6.	609/44	An, H.	3½	♀	Active tuberculous primary complex of left lung.		Cheesy tracheobron- chial lymphnodes.			$\frac{30}{(36)}$		+			+++		Tonsils +	Primary Complex	
7.	57/41	Gu, I.	4	♀						$\frac{40}{(38)}$	+++	+++	+	++	+++			Primary complex not found.	
8.	536/43	St, S.	4	♀	Fresh cheesy tuberculous pri- mary herd in left lung upper lobe.		Caseation of region and paratr. lymphnodes left.			$\frac{40}{(38)}$	+++	++	++	+	+++			Primary Complex	
9.	84/47	Fi, A.	6½	♀	Cheesy tbc. primary herd in left lung lower lobe.		Caseation and Calci- fication of region. left side hilus lymphnodes and primary trach. lymphnodes.		Total pleura adhesion left.	$\frac{80}{(45)}$	++	+++	++	+	+++		Epen- cym. +	Primary Complex	
10.	117/45	Sa, B.	7	♂	Prolif. tbc. primary comp. in left lung upper lobe with part. fusion of primary infil. and loc. perifocal spreading,		Caseation of corres- ponding lymphnodes.			$\frac{50}{(58)}$	++	++	++		+++			Primary Complex	
11.	329/45	Bu, A.	7	♀	Tuberculous primary complex in right lung upper lobe.		Wide caseation of region. trach-bron. lymphnodes.			$\frac{50}{(49)}$	+++	+++	+	+	+++	+++	Brain edge +	Primary Complex	
12.	134/41	An, P.	14	♂	Cheesy primary herd in right lung lower lobe.		Caseation of trach-bron. lymphnodes right.		Conglomerate tubercle in right hemisphere; liver; spleen.	$\frac{70}{(110)}$	++	+++	++	+	+++			Primary Complex	Spreading occurred in numerous outbreaks.

Table III Autopsy Analysis Childhood Cases.

Nr.	S. N.	Name	Age	Sex	Primary Complex	Post Primary Tuberculosis other than Miliary Tbc.										Spleen	Miliary Tuberculosis						Spreading Source	Number of Spreadings	Remarks		
						Tracheo-bronchial	Lymphnodes		Lungs	Serous membranes		Intestinal.	Kidneys and sex organs	Adrenal glands.	Other		Actual Weight Normal Weight	Lungs	Spleen	Liver	Kidneys	Other					(previous.)
							Para-aortal-abdominal	Mesenterial		Pleura	Pericard																
						Primary Herd Lymphn.																					
1.	490/48	Fr, A.	72	♂									Cavern. double kid. tbc. Pyelitis and Ureteritis tbc. ulc. Epididym.				210 (94)	+++	+++	++			Urogenital tuberculosis	at least 1			
2.	111/46	Bu, T.	73	♀	Lungs	X	X	lob.—cheesy Pneu. in all lung lobes espr. ri. Prob. gen. pri. infect.			Ulcerous intestinal tuberculosis						60 (123)	+++	++	++	++		(Lungs or tracheobronchial lymphnodes.	0	Probably a genuine exogenous superinfection in the lungs.		
3.	414/50	Pr, L.	75	♀				Large tuberculous cavern in right lung, lower lobe.		Total lung-breast adhesion right							100 (123)	+++	+++	+++	+		Lung Cavern				
4.	549/44	Me, A.	76	♀		X											150 (123)	++	+++	+++	+		Tracheobronchial lymphnodes	1			
5.	788/45	Sch, A.	77	♂	Lungs	X		Endobronchitis, caseous, in left upper lobe	Pleur. serofibrin right		Ileitis ulcerosa tuberculosa.		Laryngitis ulcer. tuberc.				80 (94)	+++	+++	+++	+	Larynx + Serous Membr. ++	Tracheobronchial lymphnodes	1	Osteitis deformans, Paget, of the right side of pelvis and the 3rd. lumbar vertebra.		
6.	555/51	Ka, L.	77	♀		X				Total right							150 (123)	+++	+++	+++	++		Tracheobronchial lymphnodes?	1	Ulcus duodeni.		
7.	672/45	Zu, K.	78	♀		X						Cavern. dbl. Kid. Tbc. Pyelitis and ureteritis both sides. Cystitis.		Tbc. cutis colliquativa Spondylitis tuberc.			110 (123)	++	++	++	++		?	1—2			
8.	71/47	Al, M.	78	♀		X					Total						255 (123)	++	++	++		Pericard + Lymphnodes +	Tracheobronchial lymphnodes	1			
9.	318/41	Ba, M.	79	♀		X											140 (123)	+++	++	++	+		Tracheobronchial lymphnodes (invasion of lung root arteries of bronchi.)	0	Arteriolosclerotic (contracted) kidneys.		
10.	679/43	Ke, M.	79	♀			X	Lobular cheesy pneumonia in right lung lower lobe.					Cheesy conglomerate Tubercle of left adrenal gland.				160 (123)	++	++	++			Cheesy Tbc. of left adrenal gland or paraaortal-abdominal lymphnodes	1	Acusticus neurinom, sinistra; Psammom of the dura.		
11.	790/43	Sch, K.	79	♀	Hilus lymphnode calcified	X	X						Cheesy sclerosing Tubercle of right adrenal gland.				60 (123)	++	++	+++	+	Pericard +	Cheesy Tbc. of ri. adrenal gland or paraaortal-abdominal lymphnodes	1			
12.	827/47	To, G.	85	♂		X							Nodular cheesy tuberculosis of prostate.				200 (78)	+++	+++	+++	++		Prostate or old cheesy tuberculosis of tracheobronchial lymphnodes	1	Cirrhosis of the liver.		

Table IV Autopsy Analysis Elderly Cases.

In the older group the spreading sources or distributing foci could not be so accurately estimated, as was possible with the young persons. The spreading source, in elderly cases, is considered to probably be a reactivation of the lymphnodes of a primary complex, or the reactivation of an old extra pulmonal haematogenous tuberculous metastasis. The most accurate analysis possible under the circumstances indicates the following probable distributing foci for the elderly persons: Definitely sure: case no. 9 in which was found a hyaline nodular lymphnode focus that had broken into a lung artery. In cases no. 4, 6 and 8 no tuberculous foci, other than hyaline nodous tuberculosis of tracheobronchial lymphnodes were found that could serve as spreading sources. In cases No. 1 and 7, the urogenital tuberculosis is with greatest probability the spreading source. Likewise in case No. 10 and 11 the most probable spreading sources were the cheesy tuberculous foci of the adrenal glands. In case No. 12 the spreading source was either a tracheobronchial lymphnode or the prostate. Case No. 2 indicates the cheesy tracheobronchial lymphnode was probably the spreading source. For case No. 3 a lung cavern is the only spreading source that could be found while in case No. 5 it was either a cheesy tracheobronchial lymphnode or caseous bronchitis that could serve as the distributing source (Table IV).

(e) The cause of the Setting-in of the Spreading.

In the childhood cases, the spreading of the tuberculosis germs almost always occurred directly after the formation of the primary complex. The body resistance in these young patients is either low, or has not yet had an opportunity to be sufficiently built up. A typical example of this is case No. 11, Bu, A., where the child received the infection from her father, who was harboring an old open lung tuberculosis. (The father in all infected 3 of his children.) In one child case, that of No. 6, the child's body resistance was most likely lowered by having had measles 5 months before exitus. Other sources from which children received a tuberculous primary infection were milk 2, aunt 1, fistelous bone tuberculosis in the same house 1, nurse 1, and grandmother 1. For five children's cases, namely No. 3, 7, 9, 10, and 12 no reasonably certain source of infection could be found (Tables I and III).

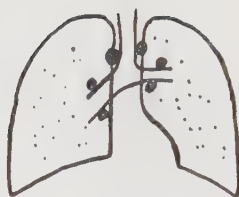
In the elderly persons, the cause of the spreading of the tuberculosis is considered to be due chiefly to the weakness of old age. No accompanying illness is considered to have markedly affected the course of the tuberculosis in them. In old age the patients' body resistance in general was so weakened, that their bodies could no longer hold any old tuberculosis in check. This is further shown in the clinical evidence of no fever, no reaction and no marked symptoms such that the existence of tuberculosis in them was overlooked. An exception is elderly case No. 2, which has many of the characteristics of a primary infection with tuberculosis.



No. 1. Heidi G.
age 1 S.N. 207/45



No. 2. Cella H.
age 3 S.N. 389/41



No. 3. Joseph P.
age 3 S.N. 497/42



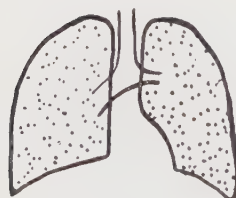
No. 4. Walter A.
age 3 S.N. 442/48



No. 5. Alice F.
age 3 S.N. 575/48



No. 6. Heidy A.
age 3½ S.N. 609/44



No. 7. Irma G.
age 4 S.N. 57/41



No. 8. Silvia S.
age 4 S.N. 536/43



No. 9. Anita F.
age 6½ S.N. 84/47



No. 10. Bernhard S.
age 7 S.N. 117/45



No. 11. Anna B.
age 7 S.N. 329/45



No. 12. Paul A.
age 14 S.N. 134/41

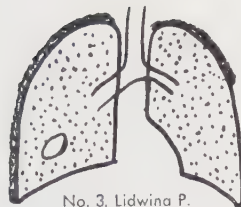
Lung Pictures of Childhood Group



No. 1. August F.
age 72 S.N. 490/48



No. 2. Therese B.
age 73 S.N. 111/46



No. 3. Lidwina P.
age 75 S.N. 414/50



No. 4. Anna M.
age 76 S.N. 549/44



No. 5. August S.
age 77 S.N. 788/45



No. 6. Lisette K.
age 77 S.N. 555/51



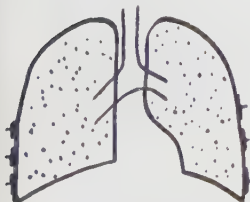
No. 7. Karoline Z.
age 78 S.N. 672/45



No. 8. Marie A.
age 78 S.N. 71/47



No. 9. Marie B.
age 79 S.N. 318/41



No. 10. Marie K.
age 79 S.N. 679/43



No. 11. Katharina S.
age 79 S.N. 790/43



No. 12. Gottfried T.
age 85 S.N. 827/47

Lung Pictures of Elderly Group

III. Special Cases.

(a) Case No. 11 of the Children's Series (Bu, A.).

This case is interesting because of the child's family background and the number of persons in it who had tuberculosis. (Child No. 2 of family series figure 3.)

Tuberculosis was discovered in this child (No. 2) on 20 Febr., 1945, as the result of an investigation of the family environment after 1 child in this family (No. 4 of figure 3) had died from tuberculous meningitis on 9 Febr., 1945, and the father was discovered at approximately the same time to be suffering from open lung tuberculosis. A second child (no. 5 of fig. 3) came to exitus on tuberculous meningitis on 27 February, 1945. The third child to come to exitus on tuberculous meningitis is child no. 2 of fig. 3 and is case no. 11 of this comparative study, shown on tables I and III; exitus in her case occurred on 16 April, 45. The father, born 1907, himself came to exitus on 30 November 45, and thus was the 4th member of this family to die from tuberculosis, after having infected all 5 of his children. The mother, born 1908, was found to have a calcified primary complex, whereas children no. 1 and 3 were each found to have a fresh primary infection; these last two children are alive today but both underwent treatment for primary tuberculosis in Davos in 1945.

In reviewing the history of the members of this family who came to exitus as a consequence of tuberculosis, namely the father, two little sons, and one daughter (who is case no. 11 of this study), the case of the father will be mentioned first.

The father was born in 1907 and seemed not have had a very rugged constitution. Between 1920 and 1943 he underwent no less than 5 operations for appendix, stomach (2), goiter, and growths in leg. In addition he had lead poisoning in 1934. About 1940 he began to have various miscellaneous complaints, and toward the end of 1944 coughing spells, high fever, a rank expectoration, and spells of not feeling well. Not until one of his small children was taken sick with tuberculous meningitis, was tuberculosis established in the father. Just before the death of the first child, the father was taken to the canton hospital in St. Gallen (early February, 1945) for treatment of the tuberculosis.

From then on until exitus, about 10 months later, the father was constantly under treatment either in the canton hospital St. Gallen or a sanatorium in Davos. The thorax Röntgen pictures in his case showed: on 8 February, 1945, a plumb sized cavern in the top of the right lung, with heavy shadows around it and streaky connections to the right hilus; on 2 June 1945 heart drawn to the right; new large flecky infiltrate with unsharp borders in the right middle field and the left medial lower field. On 25 September, 1945 caverns in all

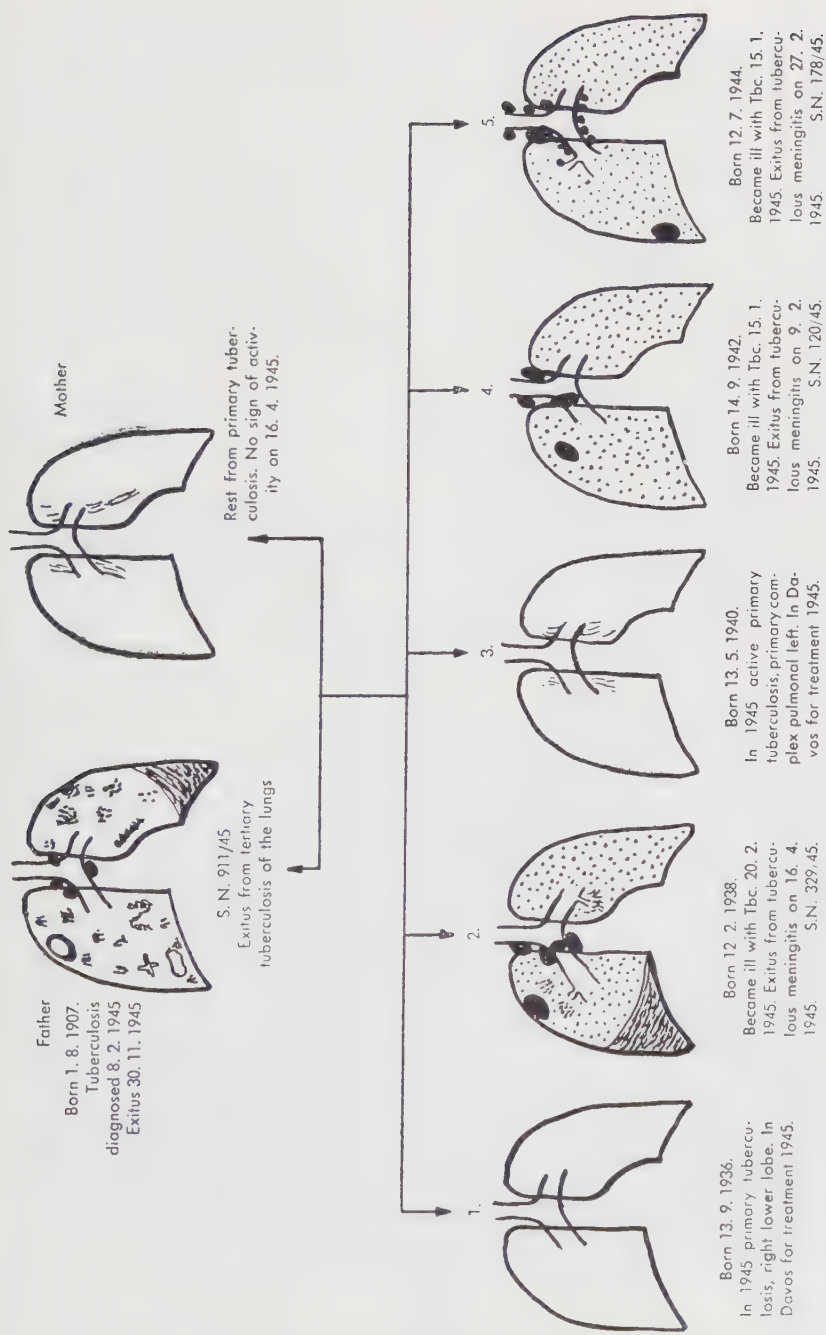


Fig. 3

fields of the right lung and large flecky, confluent shadows from the top to the base. Further there are streaky large flecky shadows in the right middle field with cavernous disintegration. In the medial part of the lower left field there are streaky large shadows.

The condition of the patient became steadily worse, with exitus at the end of November, 1945. Autopsy gave tertiary tuberculosis of the lungs, preponderately cavernous-exsudative in form. An apple sized cavern in the right upper lobe; confluent acinous and lobular cheesy pneumonia in the right lobes and in the left upper lobe with beginning fusion in the right lobes; hyaline-nodous tuberculosis of the tracheobronchial and mediastinal lymphnodes; nodular tonsillar tuberculosis; ulcerous small and large intestine tuberculosis; nodular tuberculosis of the mesenteric lymphnodes; miliary tubercles in the spleen and liver.

The oldest child, in this family, shown as no. 1 of figure 3 is alive today but was found to have a fresh primary infection, and underwent treatment for primary tuberculosis in Davos in 1945.

The second oldest child, shown as no. 2 in figure 3, who represents case no. 11 of this study, was the third child in the family to come to exitus from tuberculous meningitis. Exitus in her case occurred on 16 April, 1945. A little less than 2 months before she came to exitus, as the result of investigation of the family for sources of tuberculous infection, this girl was found to have a primary lung tuberculosis, the primary herd being in the top of the right lung.

Two weeks after the discovery of tuberculosis in this child, she entered the "Pro Juventute" sanatorium in Davos for treatment.

Upon entering the sanatorium her general condition was good, with normal clinical findings of the lungs. The Röntgen picture at this time showed a large bulbous right hilus, and directly over it a comparatively sharply bordered infiltrate, about 7/8 inch in diameter, and at the top of the right lung a round shadow also of about 7/8 inch diameter; in the fields of both lungs there were definitely increased outlines, which in some places raised the suspicion of a miliary "seeding". The sedimentation rate was 34/53. In the stomach fluids, no tubercle bacilli were found. The temperature during the first days was normal.

Two weeks after her entrance into Pro Juventute, the child began to have fever, for which at first no valid reason could be found. 10 days after this first fever, the child vomited, had no sign of meningismus but did have seemingly strongly positive dermatographismus. The next day (25 days after entry in to Pro Juventute) a lumbar puncture was made which gave: Pandy test, strongly positive; cell count 425/3 of which 230 were mononuclear; during this time the child had become somnolent. Four days later the Lasegue test was positive, and the presence of neck stiffness was noted.

Exactly 1 month after the child entered Pro Juventute, she was transferred to the canton hospital in St. Gallen. The diagnosis at the time of her entry in the canton hospital was: tuberculous meningitis, status following primary tuberculosis of the upper right lung.

During the entire ensuing 10 days that the child was in the canton hospital she had lasting febrile temperature with increasing meningismus, and somnolence. The cheeks and lips were of a livid color, the skin was pale, and the head was held stiff. There was diffuse pain on pressure, especially in the ileocaecal region. The vertebral column was stiff with pain upon tapping. The Lasegue test was positive at 80° on both sides. The head would not bend sternum-wards. The trias phenomena was present.

The sedimentation rate was 12/38 mm, the leucocyte count was 13,500 with a slight shift to the left. Another lumbar puncture gave a pressure of 220 mm and a cell count of 762/3, total protein count 270 mgr %, globuline 70 mgr %, sugar 63 mgr %, while the Goldsol test gave sharp parenchymatous and meningeal deviations. A new thorax Röntgen picture showed definite swellings of the right hilus glands with paratracheal glands; it also showed that the primary focus in the upper right lung was already threaded with striped flecky outlines. Exitus occurred 10 days after hospital entry, or approximately 2 months after the original discovery of the primary lung tuberculosis.

The autopsy revealed the following: tuberculous meningitis; early haematogenic generalization from the tuberculous primary complex in the upper lobe of the right lung, with expanded caseation of the regional tracheobronchial lymphnodes; and inflammatory hydrocephalus internus. Miliary tubercles were found in the lungs, spleen, liver and kidneys.

The third oldest child in the family, shown as no. 3 in figure 3 is alive today but like child no. 1 was found to have a fresh primary infection and underwent treatment for primary tuberculosis in Davos in 1945.

The fourth oldest child, shown as no. 4 in the family series of figure 3, was the first child to be taken sick with tuberculous meningitis. The clinical diagnosis was meningitis. Exitus occurred on 9 February, 1945, when the child was a little over 2 years of age. The autopsy report showed: tuberculous meningitis of a productive-exsudative form; otitis media tuberculosa duplex; miliary tuberculous "seeding" in the lungs, spleen, and liver; tuberculous pulmonal primary complex in the right lung with spreading caseation and nodular tuberculosis of the tracheobronchial and mediastinal lymphnodes.

The fifth (youngest) child was the second member of the family to come to exitus, from tuberculous meningitis; this occurred when it was 1 year old. The clinical diagnosis was miliary tuberculosis. Exitus occurred on 27 February, 1945. The autopsy report reveals: pyogenic tuberculous meningitis; subacute miliary tuberculosis with metastasis in the lungs, heart muscle,

spleen, liver and kidneys; tonsillar tuberculosis; otitis media tuberculosa dextra; ulcerous-nodous stomach-intestine tuberculosis; cheesy tuberculous primary focus in the lower lobe of the right lung with expanded caseation of the tracheobronchial lymphnodes on the right side; cheesy tuberculosis of the mediastinal, mesenterial, periportal, perigastric and paraaortal-abdominal lymphnodes.

(b) Case No. 2 of the Elderly Series.

The patient representing case no. 2 of the older group could not recall having had any childhood diseases. First when she was 28 years old, she had a swollen face for a year. Before that she stated she always had "weak" nerves.

The disease, about which she complained, and which later proved to be tuberculosis, apparently began about 3 months before exitus occurred.

At that beginning, she suddenly noticed that she seemed to become increasingly weaker. She further noticed, that when on stairs, she would often have to stop, as she would have spells when it was difficult for her to breathe. Next she began to cough and to expectorate a discharge. At about this time, also she began to have pain in her left side.

Four days before exitus, as a result of a continuing deterioration of her condition, she entered the canton hospital in St. Gallen; the diagnosis upon entry was pneumonia.

At the time of her entry into the hospital, the patient stated that she had had swollen legs for the "last 3 days", and that her vision had been deteriorating but she did not say how long she had noticed this fact. She further stated she had had spells of dizziness at times during the last 3 years, but no headaches. She slept good, had only a slight appetite, did not want any more solid food, likewise no fat, and that in general she had marked thirst. She complained of frequent diarrhea, but had no night sweats, and said that her difficulty in breathing had become no worse in the last few days.

Examination at time of hospital entry further showed dullness over the upper right lung in front and behind, and bronchial breathing in front. The heart's action was regular, its tone quiet, and there was outspoken peripheral cyanosis. The general condition was reduced, as there was also cachexia.

During the hospital stay the patient became increasingly weak. The temperature varied between 38 and 38.8° C. The leucocyte count was 3,500, the sedimentation rate was 23/50 mm, and the haemoglobin percent 65. The Röntgen picture, and roentgenoscopic examination revealed the following condition of the right lung: general fine speckled shadows of both the middle and upper fields; the middle and outer areas were totally shaded, while the upper field and top were shaded to a great extent.

The patient did not respond to therapy; she practically never coughed. Exitus occurred on the 4th day of the hospital stay.

The autopsy revealed: lobular-cheesy pneumonia in all lobes of the lungs, especially the right; perifocal gelatinous-desquamative pneumonia in the lobes of the right lung; pleuritis chronica fibrosa adhaesiva circumscripta on both sides; caseation of the tracheal lymphnodes; ulcerous small intestine tuberculosis; cheesy-nodular tuberculosis of one mesenterial lymphnode. Military tubercles were found in the lungs, liver, spleen and kidneys.

The finding of preponderately exsudative tuberculosis of the lungs with caseation of the tracheal lymphnodes very strongly resembles the picture of a primary complex developing into primary phthisis, with simultaneous hematogenic and canalicular spreading, and vigorous participation of the regional lymphnodes. The ulcerous small intestine tuberculosis with the co-involvement of one mesenterial lymphnode is definitely to be regarded as an "Abseuchungs" form. Also here, one finds the involvement of the regional lymphnode, which is typical for a fresh primary infection.

An old primary complex was not found. But due to the advanced age of the patient it is highly probable that she had had a primary infection in earlier years. Thus the analysis of this case indicates that this patient very probably had had a primary infection in her youth that was healed with practically complete disappearance of the primary complex so that with the passing of many years she had lost all of her antibodies. And that in her old age she acquired what might be called a "second" primary infection with its consequent course similar to a primary complex of younger persons.

(c) Case No. 7 (Zu, K.) of the Elderly Group.

This case is especially noteworthy because of the various parts of the body that were affected with tuberculosis before the condition evolved into miliary tuberculosis.

This patient stated that when 15 years of age, she suffered from weak lungs. That when she was 70 years old, she began to suffer from nervous troubles and vocal chord paralysis. When 76 eczema developed on her face and forearms. At about the same time (about 2 years before exitus) she had a severe swelling of the left knee, general fatigue, difficulty in swallowing, and a painful swelling on the border of the left foot. A few months later she developed a hump on the back, on the left hip, and on the right hand. At first there were blisters. Later the pain in the left foot became worse. At that time she said she only occasionally coughed, and hat at times a slimy expectoration.

When 77 years of age, that is approximately 1 year after the first swelling in the left knee appeared, and 16 months before exitus, the patient entered the medical clinic of the canton hospital St. Gallen. The diagnosis at the time

of this entrance was: tuberculosis colliquativa cutis on trunk, hydrops of the left knee and chronic eczema of the face and forearms, arterio-sclerosis, myodegeneratio cordis compensata.

In the hospital no tuberculous bacilli could be found in fistel of the skin tuberculosis, and the patient improved considerably. She was afebrile most of the time, but now and then had slight spurts of fever. The sedimentation rate remained constantly high. She had a tendency to diarrhea but all tests for the tuberculous bacilli in the stools were negative. After 6 months in the hospital, the patient was improved to the extent she could be released. 10 months later she again entered the hospital in a serious condition and after 5 days, exitus occurred.

On her second (last) stay in the hospital, even the slightest movement caused pain. She could not sit up, either by herself, or with the help of attendants, and had severe pain in the bones when pressed. She seemed to have a hematoma resulting from injuries on the back, left arm, and brow. During this entire second hospital stay, she had a seemingly marked tachycardia, while the temperature varied between 35.7 and 38.2° C. The sedimentation rate was 41/74. In addition, she was in a confused condition most of the time.

The autopsy showed tuberculous spondylitis of the 3rd, 4th and 5th lumbar vertebrae, with complete destruction of the inter-vertebral disc between the 3rd and 4th lumbar vertebrae. Further findings were: a cold abscess on the right side, and tuberculous spondylitis of the 9th and 11th thorax vertebrae; cavernous kidney tuberculosis on both sides; pyelitis and ureteritis tuberculosa on both sides; cystitis hemorrhagica and ulcerosa tuberculosa around the entrance of the left ureter into the bladder; tuberculosis colliquativa cutis on the back; old cheesy tuberculosis of the tracheo-bronchial lymphnodes; string shaped adhesions between the pericard and heart; adhesion of the lung pleura to the breast wall and diaphragm; osteoporosis, especially of the spinal chord, and compression of numerous vertebrae.

A "seeding" of miliary tubercles, was found in both lungs, the liver, spleen and kidneys; a few miliary tubercles were found in the ureters and bladder.

IV. Conclusions and Summary.

In reviewing and analyzing the course of miliary tuberculosis in the youthful and older groups of this report, it has been ascertained that the course of the illness in the childhood group was of an acute nature being much more rapid, intense, with higher and more changeable fever than was true of the older group. In this young group the fever was often from 38 to 40° C., and was almost always high at the end. In the older patients on the other hand, the course was more chronic in nature, relatively slower, and the fever was usually low or subfebrile, being about 36 to 37° C. most of the time; their temperature was scarcely ever alarming, and shortly before exitus was usually always about 37° C.

In the cases of childhood ages, a striking fact that soon becomes apparent is that the children always had meningitis. It is seen that the meningitis seriously complicated the course of the disease, making it very rapid, intense, feverish and refractory to therapy.

The blood findings in the young persons showed that the blood sedimentation rate in the majority of the cases was elevated. Likewise the leucocyte count in them was also greater than normal in a preponderate number of these patients, and in roughly 50% of their cases there was some shift to the left of the leucocytes.

From the anatomical analysis of the young cases, it is seen that the spreading source as a rule was always the primary complex. This was true in all 11 of the 12 cases where the primary complex could be found, whether it (primary complex) was pulmonic or intestinal. In only 1 case could no primary complex be found and in this case also no definite spreading source could be reasonably accurately determined. The source of the infection in the children could sometimes be ascertained. As a rule, each child's illness was a case of early generalization and spread of miliary tubercles as a direct succession of the primary infection. This is further borne out by the fact that (barring exceptional circumstances) the disease ran such a rapid course; a period of a little over 3 weeks being the average time noted from moment that generalization and spread began, to exitus.

In the elderly persons, as contrasted to the children, the meninges were always free of involvement; no case of spread of miliary tubercles in them was found. The fever was almost always afebrile or low in the old patients as contrasted to the frequent high fever in the children's cases.

The blood findings showed that the blood sedimentation rates were high in most cases, while the leucocyte count was, as a rule, not much increased, although there was some shift to the left of the neutrophile leucocytes. In general the blood picture corresponds to the chronicity of the infection.

Anatomically the source of spreading in the elders was seldom definitely ascertainable. In most cases it appears as a reactivation of the lymphnode of the primary complex, or of an old extra pulmonal hematogenic metastasis. An exception was case no. 2, which is an example of a spreading source ensuing from a fresh exogenous reinfection; this case resembles that of tuberculosis in a young person.

The major factor responsible for the unleashing and spreading of tubercle bacilli in the bodies of these elderly people was undoubtedly the lowered body resistance to disease, that comes with old age. This fact is also seen in the clinical course, where there was almost no fever and no reaction such that tuberculosis in them was not evident, and the disease not recognized.

Curriculum Vitae.

I, Carroll H. Taecker, a resident of Watertown, South Dakota, was born on 11 May, 1903 in Watertown, South Dakota.

1917 finished the 8 years of the regular grade school curriculum.

1921 graduated from the Watertown High School, Watertown S. D. (4 year course).

1922 began the study for the career of Naval Officer and in the year

1926 graduated from the U. S. Naval Academy at Annapolis, Maryland U. S. A. Began service as professional naval officer.

1933 to 1944 From time to time, as circumstances permitted, I studied at the following institutions of higher learning:

George Washington University, Washington D. C. U. S. A.

U. S. N. A. Postgraduate School, Annapolis, Md. U. S. A.

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1945 demobilized from service in the U. S. Navy.

I have been matriculated in the University of Zürich Faculty of Medicine since the winter semester of 1945—46.

